

# LDC Positions on Technology Transfer Issues

An Intelligence Assessment

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## LDC Positions on Technology Transfer Issues

*Central Intelligence Agency  
National Foreign Assessment Center*

*September 1978*

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### *Key Judgments*

The diversity of issues subsumed under the rubric of technology transfer for development almost precludes a meaningful summary. Nevertheless, a review of relevant country factors and stances in the North-South dialogue does point up a few important themes.

- Individual less developed countries (LDCs) have widely differing perceptions of what should be included in technology transfer agendas and substantially different interests in obtaining any given concession.
- Unlike the Common Fund and debt issues, the leading spokesmen on technology transfer are—and will likely remain—the more advanced LDCs. In particular, several of the Latin American countries have built on their well-known versions of the role of the multinational corporation and strong feelings of national sovereignty to focus one aspect of the discussion on the fairness of technology costs.
- Most LDCs—little inclined to do battle over technology transfer issues—have gone along with the G-77<sup>1</sup> positions partly for logrolling purposes and partly because they see this as yet another device to increase real resource transfers.
- Many LDCs, especially the poorer and less open, appear not to grasp the institutional barriers that would mire radical proposals for costless technology transfer. Such unrealistic demands, broadly supported at conferences in the interests of bloc unity, tend to mask the greater sophistication of the higher income LDCs which provide private firms the incentives needed for innovation.
- There are probably few LDCs with expectations of gaining anything more substantial than a technology transfer code at the various

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<sup>1</sup> See appendix C for a glossary of terms and acronyms.

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international meetings of 1978-79. Accomplishing even this will not still the farfetched rhetoric on technology banks and compensation for "brain drain," however. With regard to technology transfer, as in other areas of the North-South dialogue, the G-77 will probe widely and frequently to see if the developed countries spontaneously suggest some practical equivalents for the Third World's initial polemic demands.

- By and large, the developed countries are far from resolving how best to respond to the long list of assorted LDC demands. The United States, whose positions are only beginning to jell, is nevertheless, probably better prepared than most developed countries (DCs) on this subject.

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## PREFACE

This report on LDC positions in regard to international technology transfer draws on all available sources of information to provide an up-to-date reference for US policymakers and technicians. It was prepared in recognition of the diversity of issues and professional interests that will arise in the several international meetings on technology transfer scheduled for 1978-79. The core of the analysis is a 94-country matrix on aspects of technological development and political positions in the North-South exchange on technology. For those less concerned with the details of the individual countries, an overview and a summary table present major features of the history of the technology transfer discussion and the interests of the key LDC actors.

Few issues in the North-South dialogue between developing countries and developed countries are murkier than the question of technology transfer to the less developed countries. This stems from (a) the difficulty of defining technology transfer; (b) the complexity of the process of technology transfer and accession; and (c) the differences in the institutions of technology suppliers and recipients. Further complicating the issue is the tendency of LDCs to include on the technology transfer agenda items ranging from the behavior of multinational corporations (MNCs) to international cooperation in the design of new products. Finally, the vast range of separate topics involved requires the services of large numbers of specialists from many different fields, thus increasing the number of technical languages and concepts to be explored.

It is hoped that this paper will promote a greater understanding of the differences among the key players, especially with regard to the meetings scheduled for 1979. At the same time, we recognize that the scope of country coverage and the dynamics of the conferences themselves increase the probability of inaccuracies or change in any one country statement. To maintain the best possible current knowledge of country positions on the issues of technology transfer, we invite comments and suggestions, now or in the future.

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## LDC Positions on Technology Transfer Issues

### Background and Key Features of the Dialogue

The North-South dialogue has moved full force into what may prove the most complex and unstructured area for discussions—international technology transfer. On the broad assertion that the existing channels for this critical process are often inadequate or too costly, the LDCs have for some time been seeking substantial institutional changes, financial concessions, and suggestions for other improvements from the developed countries. Now science and technology (S&T) issues are center stage in major conferences dedicated to them, whereas, until recently, they generally had surfaced as parts of broader reviews of North-South problems.<sup>2</sup>

The step-up in the pace of meetings on the technology transfer theme is apparent from a glance at the schedule for the next 15 months.

- In August and September 1978 the industrialized nations and the LDCs have been participating in a UN conference on technical cooperation among developing countries.
- In October 1978 negotiations will open on an international code of conduct for the transfer of technology.
- Extensive preparations are now under way for the UN Conference on Science and Technology for Development scheduled for August 1979.
- In late 1979 there will be a diplomatic-level conference to revise the Paris Convention on Industrial Property (patents, trademarks, and industrial designs).

<sup>2</sup>One continuing example of this sort of inclusion in other conferences is the deep seabed mining discussion in the Law of the Sea negotiations.

Most industrialized countries see these conferences as a means to review the diverse elements involved in scientific and technical cooperation; many LDCs, however, see them as opportunities to gain additional financing and concessions on the technology process itself. The differences of views between developed-country and developing-country representatives and among specialists from a variety of technical fields suggest the need for a better initial understanding of the circumstances that led to the upcoming rounds of talks.

### History of Technology Arguments

Although LDCs have long recognized improved S&T capabilities as a condition for development, relatively little political importance was attached to this issue before the 1970s. (An extensive inventory of S&T needs of the LDCs was conducted under UN sponsorship in the 1960s; after completion, it was quietly shelved.) Technology transfer as a political issue began to take form at the 1970 conference of nonaligned nations in Lusaka. Concern with the topic grew when the Charter of Economic Rights and Duties of States, a brainchild of Mexican President Echeverria, was proposed in 1972. The final declaration of the UN General Assembly in 1974 proclaimed the right of every country to benefit from the advances and developments in science and technology.

The consolidation of LDC-DC issues into the context of the North-South dialogue gave the question of technology transfer a strong push after 1975. Because of the amorphous nature of the technology issue, however, decisions among the LDCs themselves on the subject proved more difficult than those on such issues as the Com-

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mon Fund or debt. Instead of a relatively few clear objectives, there tended to be many different national goals or concerns that were driven by factors such as stage of development of the economy, indigenous technical and scientific capability, attitude toward the foreign private sector, and willingness to cooperate in joint ventures. At best, these goals could only be represented in broad patterns. Some LDCs were primarily concerned with the acquisition of the most advanced technology, with costs a secondary issue. Some were suspicious that high charges for technology transfer were a mask for profit remittances unrelated to the transfer and wanted to reduce this loss of foreign exchange. Still others saw the simplification and adaptation of products and processes as the most important issue and were eager to cooperate in the implied research. And finally, more than a few LDC representatives at international meetings had little grasp of the basic transfer processes and even less ability to suggest changes. The result was often a disordered—and extremely long—list of subjects for discussion, ranging from control over MNCs to aspects of technical assistance. LDC views on a technology agenda jelled somewhat in 1976 when G-77 ministers adopted the Manila Declaration, a comprehensive statement of LDC demands on technology transfer and a broad range of other North-South issues.<sup>3</sup>

#### **The Current G-77 Stances**

North-South negotiations at higher diplomatic levels have until now centered on commodity price stabilization, commodity agreements, and debt relief. The wealthier and more advanced LDCs, however, have had little interest in such issues and have supported G-77 positions mainly for the sake of group solidarity. On S&T issues the situation is reversed. The high-income LDCs consider the transfer and acquisition of advanced technology to be critical for their development, while most poorer LDCs remain largely bystanders. In return for their earlier advocacy of G-77 positions, the upper tier LDCs now expect support from the largely indifferent poorer nations on technology transfer issues.

<sup>3</sup> The text of the technology transfer section of the Manila Declaration is in appendix A.

The most recent comprehensive statement of G-77 S&T demands, the Manila Declaration, puts the LDCs on record as seeking:

- Implementation of policies at the national, regional, and international levels to strengthen technological capacities in LDCs.
- Establishment of a legally binding international code of conduct for the transfer of technology, which would bear heavily on the operations of MNCs.
- Revision of the international patent system to improve LDC access to proprietary technology.
- Adoption of policies to stem the outflow of skilled manpower from LDCs and to compensate them for this "brain drain."

Until now, the LDCs have focused their energies on the development of a technology transfer code, one of the first areas to be explored in the international meetings. They attach great importance to this element because they feel their development plans are often thwarted by technology choices dictated by the MNCs, the industrial nations, and international institutions dominated by the DCs. The code, therefore, represents to them the most direct means of attacking what is viewed as a brake on suitable development. Sessions of experts on the topic during 1977-78 have helped fuel interest, and a stiff LDC resolve will probably be shown at the related meeting this October.

In contrast to the specific demands of the G-77 on a technology transfer code (which the LDCs have been working on since 1975), the developing nations are less well prepared to cope with the broader range of the S&T discussions at the 1979 UN Conference on Science and Technology for Development. The scheduled submissions to the UN Secretariat of national papers describing each country's S&T situation and needs are lagging, and the technical weakness of the delegations representing the LDCs at preparatory meetings has hindered substantive discussions with the industrialized nations. Developments at the UNCSTD, therefore, seem likely to parallel



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this month's UN Conference on Technical Cooperation Among Developing Countries, with the major result being little more than a narrowing of the scope of the now overly ambitious North-South S&T agenda.

More ominous than this muddling, however, is the risk that concrete proposals by the developed countries may only heighten the confusion. Given the diversity of the S&T interests of the LDCs, a unified G-77 position beyond broad polemics will be hard to achieve and sustain at the upcoming meetings in the face of Group B proposals designed to respond to one or another set of LDC needs. Ironically, such instability poses a danger to the industrialized nations, as some Group B offers made in good faith may be viewed by G-77 actors as calculated attempts to divide the LDCs. Whatever their technological merit, the offers could then be spurned by the G-77 leadership for political reasons. The political risk inherent in this is that some LDCs will become restless and perhaps confrontational over the failure to achieve more rapid progress in exacting changes in technology transfer processes.

#### Key LDC Actors

Despite growing attention to transfer of technology issues, many LDCs have essentially remained spectators in the preparations for the related international meetings. Only a relative few have had the technological breadth and bureaucratic depth to present well-developed arguments. Within this latter group (shown in table 1), the several larger Latin American countries—Argentina, Brazil, Colombia, Mexico, and Venezuela—have been most outspoken in formulating technology-related demands. The *Brazilians* and *Mexicans* have argued strongly for the establishment of an internationally binding technology transfer code. They have been restrained and flexible, however, compared with *Venezuela*, *Colombia*, and other Andean Pact nations; for the latter, a more aggressive stance reflects the desire to bring other countries into line with the tough standards they already set for profit remittances, transnational licensing arrangements, and other MNC operations in their countries. *Argentina* also holds strong views on technology issues and is taking a leading role on

the question of technical cooperation among LDCs.

In Asia, only India, Indonesia, and Malaysia have been especially active in addressing S&T matters. Both *India* and *Indonesia* lobby for G-77 proposals, with special emphasis on the code of conduct. Among the three, *Malaysia* takes the most restrained views, consistent with its policy of actively courting foreign investment. Throughout this aspect (and most others) of the North-South dialogue, there is a conspicuous absence of the several East Asian exporters of manufactures—*Taiwan*, *South Korea*, *Singapore*, *Hong Kong*—for whom technology transfer is, nonetheless, critical. Here the key feature seems to be mutual discomfort: the East Asians see better opportunities for gain in distancing themselves from G-77 polemics; the G-77, in turn, usually regards them as willing captives of the existing international order.

The positions of the major OPEC countries on S&T matters have been less strident than on other aspects of the North-South dialogue. *Algeria* has been the most outspoken, actively supporting G-77 demands on the technology transfer code as well as brain drain controls. The Persian Gulf states have been quiet on the brain drain issue, in large part reflecting their status as major users of skilled foreign labor. More generally, the Saudis and Iranians have shown only moderate interest in technology transfer questions. *Iran's* main concern, like that of many of the more advanced LDCs, has been to assure access to sensitive military and civilian technologies. This last issue remains key for Brazil, Argentina, India, and most of the Middle Eastern countries.

Missing from the list of key actors are the many small African and other least developed countries. This, of course, tends to rob the exchange of the authenticity that would come from a greater G-77 effort to shape technology proposals for early stages of development. Ostensibly, the poorest and smallest LDCs are relying on their bigger and more advanced brothers to look out for their interests in the wide-ranging discussions. In reality, at least twice during G-77

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Table 1  
Key Actors

Country	Key Concerns	Other Interests	Stances
Algeria .....	Access to basic and advanced technology for development of the hydrocarbons sector (refineries, petrochemicals, LNG plants, pipelines).	Technology to develop agriculture and water resources; technical training for the labor force.	Actively supports G-77 demands on technology transfer code and brain drain issues.
Argentina .....	Oil exploration and development of nuclear energy.	Technological cooperation with other LDCs.	Actively supports G-77 proposals; host of August-September 1978 UN TCDC conference.
Brazil .....	Access to advanced industrial technology, including nuclear power.	Assurance of fair payments structure for patents and copyrights.	G-77 coordinator on technology transfer code negotiations; generally seeks to avoid confrontation with Group B
Colombia .....	Access to advanced technology for petroleum and coal exploration, production, and processing.	Technology for agricultural development.	Active on brain drain and technology transfer code issues; believes G-77 negotiators are disposed to make too many early concessions on property rights.
Egypt .....	Seeks to increase inflows of Western technology by easing restrictions on private foreign investment; particularly interested in communications and desert reclamation techniques.	Food technology.	Active on brain drain and technology transfer code issues; focuses on removal of "obstacles" at the international level to the application of S&T for development.
India .....	Access to technology for energy exploration and development; seeks advanced technology in computers and armaments.	Wants to avoid foreign control of technology; seeks transfer apart from foreign investment whenever possible.	Active in formulation of G-77 positions on technology transfer code, TCDC, and brain drain; hosts international S&T conferences.
Indonesia .....	Access to minerals, engineering, and agricultural S&T.	Watches technology charges and profit remittances closely.	Actively supports G-77 proposals.
Iran .....	Access to modern armaments; nuclear power plant equipment; petrochemical industry technology; direct reduction steel plants; copper refining technology.	Seeks to attract increased direct foreign investment without sacrificing control over sectoral development.	Has shown only mild interest in technology transfer code negotiations.
Iraq .....	Access to a wide range of technology for petroleum, nuclear power, computers, petrochemicals, food processing, and irrigation.	As a socialist economy, seeks to avoid new private foreign investment, relying instead on turnkey projects.	Supports G-77 positions on technology transfer code and brain drain issues.
Ivory Coast .....	Access to modern production methods in light industry and commercial agriculture.	Actively seeks direct foreign investment.	Strong ties to French private sector restrain activism in G-77 forums.

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Jamaica .....	Access to foreign minerals and manufacturing technology.	Watches technology charges and profit remittances closely.	Sees technology transfer negotiations as integral part of NIEO; activism based more on political than economic concerns; supports G-77 position partly for logrolling reasons.
Jordan .....	Access to advanced military and basic and advanced industrial technology.	Seeks increased foreign private investment.	Proposes an international compensatory facility to aid LDCs suffering from the brain drain.
Kuwait .....	Access to modern production methods in light industry, petroleum, and petrochemicals.	Seeks advanced equipment and technical/managerial services through increased foreign investment.	Supports G-77 stances on technology transfer code and brain drain issues.
Libya .....	Access to petroleum technology.	Wants to minimize foreign influence in technology transfers.	Seeks technology transfer code to protect national sovereignty.
Malaysia .....	Access to advanced technology, particularly in extractive industries and energy.	Actively seeks foreign investment.	Embraces G-77 demands but takes restrained stances in discussions and negotiations.
Mexico .....	Seeks assurance that technology costs are not inflated (to mask profit remittances) or charged against outmoded equipment/processes; access to advanced S&T.	Development of indigenous R&D capability.	Formulates and spearheads LDC demands on S&T issues.
Nigeria .....	Access to technology for development of petroleum sector, heavy and light industry, and agriculture.	Seeks increased foreign investment as a channel for technology transfer.	Support for G-77 proposals tempered by desire for private investment.
Pakistan .....	Access to technology for the energy sector, including nuclear reprocessing.	Suspicious of large foreign business enterprises.	Supports G-77 proposals for a technology transfer code.
Peru .....	Access to technology for mining, agriculture, and light industry.	Elimination of restrictive business practices that hinder technology transfer.	Supports G-77 proposals on most S&T issues; advocacy of G-77 stances has decreased markedly over the last two years as external payments problems have mounted.
Philippines .....	Access to basic and advanced industrial technology to upgrade role of manufacturing.	Seeks to control foreign investment in accordance with government development plan.	Actively supports G-77 proposals although S&T issues generally do not have high priority.
Saudi Arabia .....	Access to advanced technology for oil refining and to develop the petrochemical industry.	Technology to develop agriculture and water resources.	Shows some support for G-77 technology transfer code proposals.
Sri Lanka .....	Access to technology with favorable employment effects.	Seeks to stem losses of skilled manpower through migration.	Supports G-77 positions on technology transfer code and brain drain issues.
Venezuela .....	Access to technology for petroleum sector and for its expanding nonpetroleum industrial sector.	Seeks controlled increase in foreign investment as a vehicle for technology transfer.	Plays a leading role in promoting G-77 demands; primary drafter of G-77 resolution on obstacles to application of S&T for development.

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discussions of the issues the poorer African nations accused the Latin Americans of being too cautious and of using technology transfer forums to advance their own national interests. There is, in fact, nothing at this stage comparable to the "second window" of the Common Fund to provide a trading point for group unity on particular proposals.

A review of country positions on technology transfer indicates no reason to characterize some key actors as radicals and others as moderates. In this field more than others, such a split is particularly inappropriate. Almost all of the countries that have made concrete proposals and which sustain discussions over the means and costs of technology transfer already have extensive contacts with the private sectors of the developed nations and recognize some of the institutional limitations on their absorbing technology. Various extreme formulations that have flowed out of the G-77 stance are largely sops to countries unlikely to be able to participate in technical discussions should these develop any real momentum. Recognizing this, the more advanced or open LDCs have not pressed especially hard to encourage widespread group participation on S&T issues through G-77 caucuses such as those that supported the Common Fund and debt topics.

#### Developed-Country Attitudes

Thus far, although they have shown considerable willingness to participate in discussions, the developed countries have felt little pressure to accede to the LDCs' initial S&T demands or timetables. They typically counter LDC emphasis on easier technology supply conditions with arguments pointing out the need for Third World countries to remove domestic obstacles to their development and to identify problem areas likely to be resolved by the application of science and technology. As this is done, they argue, the related needs for cooperation on S&T will naturally emerge and will often yield to existing technology.

On the questions of appropriate technology transfer and transfer costs, governments of the developed countries are hesitant to intervene in

what they view as contractual matters between LDC buyers and private supplying firms. The same attitude influences the views of developed countries on adopting a technology transfer code. The LDCs want such a code to help set internationally binding regulations on profit remittances, royalty payments, and the like. The major industrial countries, however, feel that voluntary codes like that on MNCs adopted by the OECD in 1976 are the way to handle such matters. Moreover, they note that even the voluntary OECD code proved difficult to achieve because of differing views on the proper regulatory role of government.

Similarly, LDC technology transfer demands in the aid context are not susceptible to simple solutions. As the dialogue takes shape, the greater emphasis on the interests of high- and middle-income LDCs seems to imply a departure from bilateral programs aimed largely at the poorest. Difficulty in defining security interests also complicates the responses of the advanced countries. In particular, the United States has been unwilling—for security reasons—to provide certain sensitive technologies to the LDCs; and, in some cases, there is disagreement among developed countries over what is sensitive. LDC access to nuclear technology is a particularly thorny issue that has produced an open rift between the United States and West Germany.

#### LDC Technology Transfer Matrix

The technology transfer matrix is an attempt to provide a frame of reference for the major technology issues in the North-South dialogue. The matrix provides information for each developing country on its technological environment, its perception of its technology needs, and its support for the various G-77 positions in the North-South technology conferences. The statistics presented in the matrix are approximations and are intended mainly to facilitate comparisons among countries.

The following information is presented as a guide to interpretation of the matrix.

*The Country column* lists countries alphabetically with 1976 per capita income shown in parentheses below each entry.

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*The Manufacturing Sector column* provides measures of the relative importance of industry in the country's economy by showing the percentage of GNP accounted for by manufacturing activity, and the number of workers employed in the manufacturing sector (excluding extractive industries). Data are for 1976 or the most recent available year.

*The Engineering Products Trade column* shows the total dollar value of the country's international trade in machinery and transport equipment—Section 7 of the UN's Standard International Trade Classification scheme (SITC). The percentage of the country's total trade accounted for by such products is shown in parentheses. Except where noted, data in this column are for the most recent year reported for the period 1974-76.

*The S&T Development columns* contain entries based on composite indexes of S&T attributes and a subjective estimate of net loss or gain in the migration of scientific personnel (the so-called brain drain). The letters H, M, and L stand for high, medium, and low rankings as compared to other LDCs. The term "scope" denotes the relative complexity of S&T skills available anywhere in the country, and "depth" signifies the extent to which S&T aptitudes are

spread among the population.<sup>4</sup> India, for example, stands high in the scope rankings because of its advanced S&T personnel and facilities, places low in the depth rankings because of its widespread illiteracy and low per capita income, and turns up as a net loser under migration of S&T personnel.

*The Key Technology Concerns column* lists the sorts of technology transfer (or related problems) that most interest the particular LDC. Entries reflect concerns that would drive the country's S&T policy even in the absence of the North-South dialogue.

*The Stances on G-77 Proposals column*, the primary element of the matrix, presents any and all information we have about each country's views on LDC technology transfer proposals, including its stances on such issues as:

- Enactment of an international code of conduct on technology transfers.
- Policies to stem the outflow of skilled manpower through migration (the brain drain or reverse transfer of technology issue).
- Increased technical cooperation among developing countries (TCDC).
- Increased official technical assistance.

<sup>4</sup> See appendix B.

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Table 2  
Technology Transfer Matrix

Country (per Capita GNP)	Economic System	Manufacturing Sector		Engineering Products Trade		S&T Development			Key Technology Concerns	Stances on G-77 Proposals
		GNP Share	Labor Force (Thousands)	Imports (Million \$)	Exports (Million \$ and %)	Scope <sup>1</sup>	Depth <sup>1</sup>	Migration <sup>2</sup>		
Algeria (\$885)	Socialist economy; foreign investment unwelcome except for projects involving high technology or export industries; has used service contracts to secure skills/processes from multinational corporations.	approx. 10%	660	870 (38)	17 (less than 1) (1973)	H	M	-	Access to basic and advanced industrial technology; technology to develop agriculture and water resources; technical training for the labor force.	Actively supports G-77 demands on technology transfer code and brain drain issues.
Angola (\$500)	Socialist in modern sector.	less than 10%	NA	214 (34)	8 (less than 1)	L	M	-	Access to both basic and advanced agricultural and light industrial technology; seeks help in: oil production; iron ore, copper, and diamond mining; railroad transportation; and commercial farm production and processing of coffee and sugar.	Inactive in international technology transfer discussions.
Argentina (\$1,810)	Market economy with large government productive enterprises in energy and transportation; seeks foreign direct investment to complement national investment.	34%	2,500	810 (20)	399 (14)	H	H	°	Oil exploration; development of nuclear energy.	Activity on S&T issues contrasts with relative lack of interest in other G-77 demands; seeks technology transfer code and development of measures to deal with brain drain problem; host of Aug.-Sept. 78 UN Conference on Technical Cooperation among Developing Countries.

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Bahamas (\$3,500)	Market economy; actively seeks new foreign direct investment; tax haven.	16%	14	69 (4)	16 (1)	L	H	+	Seeks technology cost arrangements—particularly in the oil industry—that do not strain the balance of payments. Also seeks assurances that imported technology will not displace the local work force.	Limited interest in issue, but supports most G-77 formulations.
Bahrain (\$2,000)	Market economy with large government productive enterprises in the petroleum sector; seeks foreign investment to develop as a regional service and commercial center.	42%	NA	393 (40)	89 (26)	L	H	+	Access to industrial/petroleum technology; emphasizes training indigenous personnel to replace foreign workers.	Inactive in international S&T conferences.
Bangladesh (\$85)	Market economy with large government enterprises in all major industries; seeks direct foreign investment and management (service) contracts.	less than 10%	1,560	136 (14)	NA	L	L	-	Seeks foreign support in oil and gas exploration, fertilizer production, and other advanced sectors. Prefers labor intensive activities where possible.	Supports G-77 technology transfer code proposals; seeks increased financial and technical assistance for development projects.
Barbados (\$1,370)	Market economy; seeks foreign investment; offers tax and tariff incentives.	approx. 10%	25	39 (18)	6 (6)	L	H	NA	Access to modern production methods in light industries; also concerned about technology transfers that might jeopardize local employment opportunities.	Limited interest in issue but supports most G-77 formulations.

Footnotes at end of table.

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Table 2

## Technology Transfer Matrix (Continued)

Country (Per Capita GNP)	Economic System	Manufacturing Sector		Engineering Products Trade		S&T Development			Key Technology Concerns	Stances on G-77 Proposals
		GNP Share	Labor Force (Thousands)	Imports (Million \$)	Exports (Million \$ and %)	Scope <sup>1</sup>	Depth <sup>1</sup>	Migration <sup>2</sup>		
Benin (\$190)	Socialist in modern sector; requires that new foreign investments be joint with government as minority shareholder.	less than 10%	117	43 (26)	2 (6)	L	L	-	Access to basic agri- cultural and light in- dustrial technology, including coffee, co- coa, and such simple consumer industries as match factories, tire plants, and pro- cessed foods.	Inactive on most S&T issues; seeks greater technical as- sistance.
Bolivia (\$430)	Market economy with large-scale government participation in mining and petroleum; seeks for- eign direct investment and—in petroleum—ser- vice and operation con- tracts.	approx. 10%	200	61 (34) (1972)	NA	M	M	-	Petroleum explora- tion and tin and oth- er mineral mining and processing.	Supports G-77 posi- tions on technology transfer code and brain drain.
Botswana (\$285)	Market economy; sees for- eign investment as a key factor in its development plans; actively seeks pri- vate capital for develop- ment of minerals, manu- facturing, and agriculture.	less than 10%	8	NA	NA	L	M	-	Access to basic agri- cultural and indus- trial technology; rail- road transportation technology; and min- ing and processing technology for cop- per, nickel, and dia- monds.	More concerned with relations with South Africa than with G- 77 positions on glo- bal technology trans- fer.

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Brazil (\$1,010)	Primarily free enterprise, but parastatals are important in extractive industries, manufacturing, shipping, and some foreign trade; welcomes foreign investment, particularly to promote transfer of advanced technology and to expand exports.	25%	5,340	4,305 (32)	957 (9)	H	H	+	Access to advanced industrial technology; assurance of fair payments structure for patents and copyrights.	Plays a leading role in UNCTAD efforts on international code of conduct for technology transfers; as G-77 coordinator on transfer of technology code issues, seeks to develop stances amenable to negotiation with Group B while keeping confrontation minded LDCs in check; status as a G-77 member that benefits from the brain drain a potential source of embarrassment vis-a-vis other LDCs.
Burma (\$120)	Only slowly emerging from self-imposed political isolation; socialist economy; prohibits private foreign investment; permits off-shore oil exploration by foreign firms.	10%	855	60 (34)	NA	L	L	-	Oil production technology, primarily—but not exclusively—offshore; marine and fresh water fishing modernization and fish-product processing.	Unknown. Burma only recently began to talk to IFIs (ABD, IMF, IBRD) and remains aloof from most N/S discussions.
Burundi (\$105)	Market economy with elements of socialism in modern sector; very liberal investment code; seeks investment in minerals and agricultural sectors having export potential.	less than 10%	48	NA	NA	L	L	-	Basic agriculture and industry, especially processing for agricultural products, such as coffee and tea.	Supports G-77 efforts for technology transfer code; seeks increased technical assistance.
Cameroon (\$385)	Market economy; encourages private foreign investment within the guidelines of the official development plan.	15%	49	190 (32)	11 (2)	L	M	NA	Ongoing development plan focuses on agricultural industries, light consumer goods industries, and oil production.	Has shown some interest in technology transfer code negotiations.

Footnotes at end of table

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Table 2

## Technology Transfer Matrix (Continued)

Country (Per Capita GNP)	Economic System	Manufacturing Sector		Engineering Products Trade		S&T Development			Key Technology Concerns	Stances on G-77 Proposals
		GNP Share	Labor Force (Thousands)	Imports (Million \$)	Exports (%)	Scope <sup>1</sup>	Depth <sup>1</sup>	Migration <sup>2</sup>		
Central African Empire (\$170)	Market economy; prefers joint ventures that contribute to economic development.	13%	NA	26 (38)	Negl	L	L	-	Critical need for basic agricultural technology—most rural production is for subsistence only; potential for uranium mining; simple consumer goods industries including tires, food processing, and textiles.	Inactive on global technology transfer issues.
Chad (\$75)	Market economy; offers tax and customs exemptions for new investments; prefers joint ventures.	less than 10%	26	21 (Negl)	Negl	L	L	-	Access to basic agricultural and industrial technology, such as irrigation, food processing, and food production; access to oil extraction and refining technology.	Seeks increased official technical assistance.
Chile (\$810)	Market economy with extensive government participation in copper mining, other mineral resources, and energy sector; actively seeks large-scale foreign investment.	26%	635	439 (23)	8 (Negl)	H	H	+	Access to technology for offshore petroleum exploration, food processing industry, and exploitation of mineral and timber resources.	Shows greater interest in S&T issues than in other G-77 proposals; host of subregional conference in preparation for UNCSTD; dropped out of Andean Pact in 1976 to avoid Pact restriction on direct foreign investment.
Colombia (\$660)	Market economy; generally favorable toward foreign investment, but Andean Pact regulations apply.	19%	728	583 (39)	32 (2)	H	M	-	Access to advanced technology for petroleum and coal exploration, production, and processing.	Active on brain drain and technology transfer code issues; believes G-77 negotiators are disposed to make too many early concessions on property rights.

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Congo (\$430)	State-controlled socialist economy except for petroleum industry, where government participation is 35%.	approx. 10%	88	59 (36)	Negl	L	M	NA	Access to agricultural technology for coffee, cocoa, palm products, tobacco, and groundnuts. Recent departure of French leaves critical technology gap in most state-owned industries: cement, potash, sugar refining, and copper and zinc mining.	Inactive on global S&T issues.
Costa Rica (\$1,300)	Market economy; encourages a wide range of foreign investment, especially those which use local raw materials.	20%	130	187 (27)	15 (3)	M	H	-	Access to basic and advanced technology; gives concessions to foreign capital as incentive to increase technology inflows.	Generally supports G-77 positions on trade and development matters. Believes developed countries have duty to give trade and technological assistance to the developing countries. Relatively inactive on S&T issues.
Dominican Republic (\$785)	Market economy; incentives provided for import substitution, assembly operations for reexport, and tourism.	18%	104	106 (34)	NA (Negl)	L	M	-	Seeks technology transfer arrangements that do not strain the balance of payments; otherwise, issue has low priority.	Technology transfer perceived as much less important issue than others in N/S dialogue; will support broad G-77 formulations.
Ecuador (\$715)	Market economy; natural resource exploitation and some basic industries reserved for public sector investment.	17%	260	273 (40)	4 (Negl)	M	M	NA	Access to technology particularly for petroleum exploration and refining and for hydroelectric generation.	Supports G-77 positions on technology transfer code and brain drain issues.
Egypt (\$340)	Mixed capitalist-socialist economy; since 1973, the government has encouraged and facilitated private foreign investment, especially in export-oriented projects.	22%	1,000	1,175 (30)	11 (less than 1)	H	M	-	Seeks to increase inflows of Western technology by easing restrictions on private foreign investment; particularly interested in communications and desert reclamation techniques.	Active on brain drain and technology transfer code issues; helped draft strong G-77 resolution on obstacles to the application of S&T for development.

Footnotes at end of table.

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## Technology Transfer Matrix (Continued)

Country (Per Capita GNP)	Economic System	Manufacturing Sector		Engineering Products Trade		S&T Development			Key Technology Concerns	Stances on G-77 Proposals
		GNP Share	Labor Force (Thousands)	Imports (Million \$)	Exports (%)	Scope	Depth	Migration		
El Salvador (\$540)	Market economy; provides tariff and tax incentives for foreign investment.	19%	210	158 (26)	12 (2)	M	H	-	Basic agricultural and industrial technology; geothermal energy.	Supports G-77 technology transfer code proposals.
Ethiopia (\$100)	Socialist in modern sector; nationalized most large foreign investments in the mid-1970s.	approx. 10%	565	84 (28)	10 (4)	L	L	-	Access to technology for agriculture, coffee processing, and light industry.	Wants increased official technical assistance.
Fiji (\$1,000)	Market economy; welcomes foreign investment; grants tariff and tax concessions to processing and manufacturing industries.	approx. 10%	16	54 (20)	4 (2)	M	H	NA	Access to technology for expanding and diversifying agricultural output and exploiting its major mineral resources—gold and copper.	Inactive on global S&T issues.
Gabon (\$3,000)	Market economy; actively encourages foreign investment; seeks to diversify beyond mineral exploitation and timber production.	less than 10%	19	64 (41)	2 (1) (1973)	L	H	+	Ambitious 1976-80 development program needs substantial foreign technology in all phases of agriculture and industry; anxious to expand local participation at managerial level, but remains dependent on French expertise to keep modern economy functioning.	Has shown interest in brain drain issue.
Gambia (\$200)	Market economy; welcomes foreign investment in labor-intensive and export-oriented industries.	less than 10%	5	7 (14)	NA	L	L	NA	Basic agricultural and industrial technology, particularly irrigation and light consumer industries.	Seeks increased official technical assistance.

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Ghana (\$450)	Market economy with large-scale government participation in cocoa marketing; provides incentives for substantial foreign investments in petroleum exploration and production, bauxite/alumina, and deep sea fishing; requires joint ventures.	approx. 10%	570	198 (25)	1 (Negl)	M	M	-	Access to technology in such areas as cocoa production, petroleum, bauxite, alumina, and light consumer goods.	Supports G-77 positions on technology transfer code and brain drain.
Guatemala (\$685)	Market economy; favorable attitude toward foreign investment; provides some tax relief.	16%	180	110 (26) (1973)	8 (2)	M	M	-	Access to technology for exploitation of petroleum, copper, and nickel resources.	Supports G-77 technology transfer code proposals.
Guinea (\$155)	Socialist economy in modern sector; deals flexibly with foreign investors; seeks to expand food production, reduce import dependence, and increase exports.	less than 10%	NA	NA	NA	L	L	NA	Particularly anxious to bring in agricultural technology; modern sector largely dependent on bauxite/alumina industry for which no indigenous expertise is available.	Supports G-77 proposals for increased official technical assistance.
Guyana (\$525)	Market economy with elements of socialism; government policies discourage foreign investment	approx. 10%	28	55 (22)	Negl	L	H	-	Access to technology for exploration of bauxite reserves and alumina processing.	Inactive on international S&T issues; generally supports G-77 proposals on other issues.
Haiti (\$195)	Market economy; provides tariff and tax incentives for foreign investment; seeks increased investment in agriculture, natural resource development, regional diversification, import substitution, and assembly industries.	approx. 10%	312	29 (20)	2 (3)	L	M	-	Agricultural development.	Supports G-77 positions on brain drain and increased technical assistance.
Honduras (\$390)	Market economy; seeks foreign investment to speed economic development; prefers joint ventures with local majority.	15%	75	113 (28)	NA	L	M	-	Access to technology for development of agriculture, forestry, and electric power generation and distribution.	Generally supports G-77 proposals on technology transfer code.

Footnotes at end of table.

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## Technology Transfer Matrix (Continued)

Country (Per Capita GNP)	Economic System	Manufacturing Sector		Engineering Products Trade		S&T Development			Key Technology Concerns	Stances on G-77 Proposals
		GNP Share	Labor Force (Thousands)	Imports (Million \$ and %)	Exports (Million \$ and %)	Scope	Depth	Migration		
India (\$125)	Market economy; public ownership of big new facilities connected with modernization—steel mills, oil refineries, armament—and of railroads, energy sector, and commercial banks; highly selective criteria for foreign investment; seeks projects that expand exports or result in technology transfer.	16%	26,520	983 (16)	322 (7)	H	L	-	Energy exploration and development; seeks advanced technology in computers and armaments, but with Indian control; seeks technology transfer apart from foreign investment whenever possible.	Active in formulation of G-77 positions on technology transfer code, TCDC, and brain drain; helped draft strong G-77 resolution on obstacles to the application of S&T for development; host for NAM and UNIDO S&T conferences.
Indonesia (\$270)	Largely free enterprise economy but includes major government firms in oil and domestic trade. Foreign investment sought to supplement domestic efforts; incentives favor mainly labor-intensive, export-oriented, and resource-processing industries.	less than 10%	6,600	2,310 (41)	53 (less than 1)	H	M	+	Easy access to foreign minerals S&T; seeks aid in basic agricultural and engineering S&T; watches technology charges and profit remittances closely.	Actively supports LDC technology transfer proposals; assigns them fairly low priority compared with Common Fund and other N/S issues.
Iran (\$2,020)	Market economy with large government petroleum sector; seeks foreign investment, particularly in high technology and export-oriented enterprises; requires joint ventures with local majorities.	approx. 10%	2,120	4,990 (43)	NA	H	M	+	Nuclear power plant equipment; petrochemical industry technology; direct reduction steel plants; copper refining.	Has shown only mild interest in technology transfer code.
Iraq (\$1,395)	Socialist economy; does not seek new foreign investment.	approx. 10%	156	1,720 (41)	Negl	H	M	+	Nuclear power technology; irrigation; petrochemicals; food processing equipment; computers.	Supports G-77 positions on technology transfer code and brain drain issues.

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Ivory Coast (\$640)	Market economy; actively seeks direct foreign investment.	16%	130	422 (33)	29 (2)	M	H	+	Access to modern production methods in light industry and commercial agriculture—coffee, cocoa, and timber.	Strong ties to French private sector restrain activism in G-77 forums.
Jamaica (\$1,440)	Primarily free enterprise economy; some socialist features; prefers to work on a joint venture basis with foreigners; incentives now provided for labor-intensive industries that are export oriented or import substitutive.	13%	81	250 (22)	3 (Negl)	M	M	-	Seeks easy access to foreign minerals/manufacturing technology; watches technology charges and profit remittances closely.	Advocates formulation of a code of conduct for technology transfer; activism on issue based more on political than economic concerns.
Jordan (\$820)	Market economy; provides tariff and tax incentives for foreign private investment.	approx. 10%	94	232 (32)	21 (14)	M	M	+	Access to basic and advanced industrial technology, especially in the fertilizer industry.	Actively supports G-77 brain drain positions; proposed an international labor compensatory facility to aid LDCs suffering losses of skilled manpower through migration.
Kenya (\$230)	Market economy; actively encourages private foreign investment; provides incentives for import-substituting and export-promoting industries.	14%	255	278 (30)	3 (1)	M	M	°	Basic technology in agriculture and industry, especially textiles and auto assembly.	Supports G-77 brain drain proposals.
Kuwait (\$12,500)	Market economy with large government presence in petroleum sector; welcomes foreign investment to diversify petroleum-based economy; uses foreign investment as a channel for advanced foreign equipment and technical and managerial services.	Less than 10%	88	1,090 (46)	185 (2)	M	H	+	Access to modern production methods in light industry and petroleum and petrochemical technology.	Supports G-77 stances on technology transfer code and brain drain issues.

Footnotes at end of table.

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## Technology Transfer Matrix (Continued)

Country (Per Capita GNP)	Economic System	Manufacturing Sector		Engineering Products Trade		S&T Development			Key Technology Concerns	Stances on G-77 Proposals
		GNP Share	Labor Force (Thousands)	Imports (Million \$ and %)	Exports (Million \$ and %)	Scope <sup>1</sup>	Depth <sup>2</sup>	Migration <sup>3</sup>		
Lebanon (\$400)	Market economy; no new foreign investments are being made because of unstable conditions in the south, but foreign investment is desired.	15%	110	312 (25)	128 (26) (1973)	M	M	-	Fairly high level of native business and technical managerial capability; traditionally good access to foreign technical skills (especially in Europe); most pressing new needs will depend on shape of reconstruction programs after peace.	Supports G-77 brain drain proposals.
Lesotho (\$180)	Market economy; seeks to maximize foreign investment by offering a wide range of generous investment incentives.	less than 10%	9	NA	NA	L	L	-	Access to basic agricultural and processing technology and advanced diamond mining technology; fears blockage by South African firms of developments that would be competitive in the South African market.	Seeks increased official technical assistance.
Liberia (\$600)	Market economy; provides tax and tariff incentives for foreign investment.	less than 10%	58	116 (35)	2 (Negl)	L	M	-	Access to basic agricultural and industrial technology including food processing, iron mining, and rubber production.	Has shown interest in technology transfer code.
Libya (\$5,600)	Strong state intervention in the economy; generally discourages direct foreign investment, except on a highly selective basis in the crude oil sector; considers direct foreign investment a violation of national sovereignty and existing policies call for disinvestment by foreigners.	less than 10%	64	1,218 (34)	NA	M	M	NA	Wants foreign know-how but desires to be free of foreign influence; seeks turnkey projects.	Supports G-77 proposals for a technology transfer code.

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CONFIDENTIAL	Madagascar (\$260)	Market economy with elements of socialism; mildly interested in joint ventures for exploitation of mineral resources.	approx. 10%	26	58 (21)	1 (Negl)	L	M	NA	Access to basic agricultural and industrial technology.	Supports G-77 positions on technology transfer code and brain drain issues.
	Malawi (\$125)	Market economy; desires foreign investment in labor-intensive industry with import-substitution capabilities.	15%	29	54 (29)	5 (4)	L	L	NA	Access to basic agricultural and industrial technology.	Seeks increased official technical assistance.
	Malaysia (\$855)	Market economy; increasing government role in economy is aimed toward acquiring larger share of economic participation by ethnic Malays; government actively promotes foreign investment through tax and export incentives	16%	480	1,151 (33)	239 (6)	M	H	°	Access to advanced technology, particularly in the extractive industries and to energy-related technology such as LNG and oil equipment.	Embraces LDC demands on technology transfer code and brain drain, but takes restrained stances in discussions and negotiations.
	Mali (\$70)	Market economy with elements of socialism; offers tax incentives for foreign investment in selected industries; requires 10- to 50- percent government equity.	less than 10%	84	29 (16)	3 (4)	L	L	-	Access to basic agricultural and industrial technology, such as irrigation, food processing, beef production, and small consumer goods assembly.	Seeks increased official technical assistance.
	Mauritania (\$215)	Market economy with elements of socialism; nationalized iron and copper properties in the mid-1970s; does not actively seek foreign investment.	29%	16	36 (42)	6 (5) (1972)	L	M	-	Access to basic industrial and agricultural technology, such as beef production and irrigation; access to iron ore mining and processing and transportation technology.	Not active on global S&T issues.
	Mauritius (\$555)	Market economy; welcomes foreign investment in export-oriented and labor-intensive industries.	15%	11	73 (22)	10 (3)	L	M	NA	Access to basic agricultural (sugar) and industrial technology.	Not active on global S&T issues.

Footnotes at end of table.

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## Technology Transfer Matrix (Continued)

Country (Per Capita GNP)	Economic System	Manufacturing Sector		Engineering Products Trade		S&T Development			Key Technology Concerns	Stances on G-77 Proposals
		GNP Share	Labor Force (Thousands)	Imports (Million \$ and %)	Exports (Million \$ and %)	Scope <sup>1</sup>	Depth <sup>1</sup>	Migration <sup>2</sup>		
Mexico (\$1,285)	Primarily free enterprise economy, but includes government firms in oil, commerce, and manufacturing/processing; prohibits foreign investment in many industries; permits direct foreign investment for import substitution, export promotion, and development of lagging regions; prefers majority Mexican ownership.	25%	3,000	2,245 (37)	285 (10)	H	H	+	Seeks assurance that technology costs are not inflated (to mask profit remittances) or charged against outmoded equipment/processes; access to advanced S&T; development of indigenous R&D capability; government must approve all foreign technology transfers.	Formulates and spearheads LDC demands on S&T issues; helped draft strong G-77 resolution on obstacles to the application of S&T to development.
Morocco (\$470)	Market economy with dominant public sector; offers tax and credit incentives for tourism and selected industries.	13%	750	732 (29)	7 (Negl)	M	M	-	Access to mining and processing technology for phosphates.	Exhibits interest in G-77 technology transfer code proposals.
Mozambique (\$250)	Seeks foreign private investment, but transition from market economy to socialism is restraining investor interest.	approx. 10%	NA	79 (24)	NA (1972)	M	M	-	Access to basic agricultural and industrial technology to improve domestic self-sufficiency; access to advanced technology in oil refining, transport, and mining; fears exploitation by private industry, particularly by large multinational corporations.	Not active on global S&T issues.
Nepal (\$95)	Market economy; encourages private foreign investment in tourism.	less than 10%	100	NA	NA	L	L	NA	Would welcome multilateral official financial and technical support in developing hydropower resources.	Seeks increased official technical assistance.

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Nicaragua (\$820)	Market economy; government regulations and administrative practices encourage foreign investment.	21%	96	141 (27)	2 (Negl)	M	H	-	Access to agricultural technology to increase exports.	Not active on global S&T issues.
Niger (\$105)	Market economy; provides incentives for foreign investment in a wide range of industries.	approx. 10%	27	27 (28)	5 (5)	L	L	-	Access to basic agricultural and industrial technology, such as irrigation, food processing, and beef production; access to uranium mining technology.	Seeks greater official technical assistance.
Nigeria (\$470)	Market economy with government participation in petroleum, steel, banking and insurance; welcomes foreign investment that transfers technology, uses local raw materials, and produces import substitutes; requires joint ventures.	less than 10%	2,475	2,536 (42)	NA	M	L	+	Access to technology for petroleum extraction, refining, and distribution; heavy industry (steel, cement); light industry (auto assembly, textiles, consumer durables); and agriculture (palm products, food-grains, coffee, cocoa, rubber).	Support for G-77 proposals on technology transfer code is tempered by desire for private investment; seeks increased technical assistance.
North Yemen (\$270)	Market economy; seeks foreign investment for import substitution and as a source of training for the labor force.	less than 10%	NA	46 (16)	Negl	L	L	-	Access to basic technology to develop infrastructure and agriculture and to train the labor force.	Supports G-77 brain drain proposals; seeks increased official technical assistance.
Oman (\$2,875)	Market economy with government participation in petroleum; encourages foreign investment for import-substitution and employment impact.	less than 10%	56	278 (41)	NA	L	M	+	Access to foreign minerals/petroleum technology.	Shows interest in G-77 technology transfer code proposals.
Pakistan (\$170)	Market economy with large public sector; suspicious of large business enterprises; favors foreign investment that brings foreign exchange earnings.	21%	3,470	513 (24)	15 (1)	M	M	-	Oil and gas production technology; modernization of textile and fishing industries; larger and additional power plants to meet increasing energy consumption needs, including a nuclear reprocessing plant; improved medical technology.	Supports G-77 proposals for technology transfer code.

Footnotes at end of table.

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## Technology Transfer Matrix (Continued)

Country (Per Capita GNP)	Economic System	Manufacturing Sector		Engineering Products Trade		S&T Development			Key Technology Concerns	Stances on G-77 Proposals
		GNP Share	Labor Force (Thousands)	Imports (Million \$)	Exports (%)	Scope <sup>1</sup>	Depth <sup>1</sup>	Migration <sup>2</sup>		
Panama (\$1,175)	Market economy with large public sector; provides tax incentives for direct foreign investment.	15%	30	155 (20)	NA	M	H	NA	Access to technology for hydroelectric power and copper exploration.	Supports G-77 proposals for technology transfer code.
Papua-New Guinea (\$520) <sup>1</sup>	Market economy; seeks large-scale foreign investment for development of its rich natural resources.	15%	151	87 (27)	13 (2)	M	M	NA	Access to mining technology for developing copper, gold, and chromite resources; light industry technology for fish canning and forestry.	Not active on global S&T issues.
Paraguay (\$625)	Market economy with large public sector; provides tax and tariff incentives for foreign investments that process local raw materials and promote exports.	16%	150	27 (38) (1969)	NA	L	M	-	Access to basic technology for agricultural development and to advanced technology for hydroelectric projects.	Not active on global S&T issues.
Peru (\$775)	Market economy with elements of socialism; extensive government bureaucracy discourages foreign investment.	26%	800	522 (34)	11 (less than 1)	M	H	-	Access to mining and processing technology for copper, zinc, and lead; access to basic agricultural and light industrial technology; elimination of restrictive business practices that hinder technology transfer.	Supports G-77 proposals on most S&T issues; advocacy of G-77 stances has decreased markedly over the last two years as external payments problems have mounted.
Philippines (\$385)	Market economy with large public sector in oil trade and development projects; seeks foreign investment in accordance with government development plan.	21%	1,320	1,198 (32)	10 (Negl)	H	M	-	Access to basic and advanced industrial technology; is attempting to upgrade role of manufacturing industry.	Actively supports G-77 technology transfer code and brain drain proposals, but generally does not give high priority to S&T issues.

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Qatar (\$12,660)	Market economy with large government petroleum sector; seeks foreign investment in the form of equipment and know-how; requires joint ventures with majority local participation.	less than 10%	NA	210 (51)	9 (17)	L	H	+	Access to petroleum and petrochemical technology.	Not active on global S&T issues.
Rwanda (\$140)	Market economy with elements of socialism; seeks foreign private investment for export growth, import-substitution, and employment effects.	less than 10%	19	25 (26)	Negl	L	L	-	Access to basic agricultural and industrial technology.	Not active on global S&T issues.
Saudi Arabia (\$7,585)	Market economy with large government petroleum sector; seeks foreign direct investment for industrialization; requires joint ventures; provides a variety of incentives to attract investments incorporating advanced technology.	less than 10%	210	1,050 (37)	Negl	M	M	+	Access to advanced technology for oil refining and the petrochemical industry; basic technology for development of agriculture and water resources.	Shows some support for G-77 technology transfer code proposals.
Senegal (\$385)	Market economy with elements of socialism; seeks foreign investment for development; provides generous incentives.	13%	80	184 (19)	51 (8)	M	M	-	Access to basic agricultural and industrial technology, such as irrigation and food processing; access to some advanced technology, such as oil refining and commercial sugar production.	Supports G-77 technology transfer code proposals.
Sierra Leone (\$215)	Market economy; seeks to expand through foreign investment, particularly in mining projects.	less than 10%	126	46 (21)	NA	L	M	-	Access to basic agricultural and industrial technology, especially iron and diamond mining.	Supports G-77 technology transfer code proposals.
Singapore (\$2,520)	Market economy with large public sector, offers incentives for all foreign investment, particularly high technology industries that increase productivity	26%	153	2,346 (26)	1,663 (25)	H	H	o	Government is shifting emphasis to higher technology industries; desires ready access to a broad range of advanced technology.	Supports LDC proposals, but maintains very low profile role in international forums.

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Table 2  
Technology Transfer Matrix (Continued)

Country (Per Capita GNP)	Economic System	Manufacturing Sector		Engineering Products Trade		S&T Development			Key Technology Concerns	Stances on G-77 Proposals
		GNP Share	Labor Force (Thousands)	Imports (Million \$ and %)	Exports (Million \$ and %)	Scope <sup>1</sup>	Depth <sup>1</sup>	Migration <sup>2</sup>		
Somalia (\$95)	Market economy with elements of socialism; lack of clear guidelines has discouraged foreign investment.	less than 10%	55	31 (22)	Negl	L	L	-	Access to technology for achievement of self-sufficiency in food supplies (especially cereals and sugar), development of food processing industry, transport, communications, and export diversification.	Generally supports G-77 technology transfer code proposals.
South Korea (\$700)	Market economy; gives priority to foreign investments in heavy industry, chemicals, and electronics; prefers direct investment to technology licensing arrangements.	24%	1,365	2,386 (27)	1,276 (16)	H	H	-	Easy access to advanced foreign technology and expansion of the domestic R&D base; key sectors for foreign technology are machinery, shipbuilding, electronics, electric power, metals, chemicals, and textiles; desires to upgrade technology in industry, especially for export.	Generally maintains low-key approach and goes along with G-77 positions; stance based more on political than economic concerns.
South Yemen (\$295)	Principal services and industry nationalized; private enterprises limited mainly to trade and handicrafts.	less than 10%	52	13 (6)	1 (1) (1969)	L	M	-	Basic technology needed to build infrastructure and to develop import-substituting light industries.	Generally supports G-77 position on technology transfer code; seeks increased official technical assistance.
Sri Lanka (\$205)	Market economy with large public sector; offers wide range of incentives to attract private foreign investment for export development.	13%	590	64 (9)	NA	M	M	-	Primarily interested in employment opportunities; emphasizes official foreign assistance for irrigation projects and private investment in export trade zone.	Supports G-77 positions on technology transfer code and brain drain issues.

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Sudan (\$235)	Market economy with elements of socialism; provides tax incentives for foreign investments promoting development.	less than 10%	306	307 (32)	4 (less than 1)	L	L	-	Access to technology for agricultural expansion, mineral reserve exploitation (iron ore, chromite), and industrial development.	Seeks increased official technical assistance.
Surinam (\$1,250)	Market economy; offers generous tax and tariff concessions to foreign investors in labor-intensive and export-oriented operations; prefers joint ventures, particularly in extractive industries.	NA	NA	36 (25) (1972)	NA	L	H	NA	Favors technology improvement mainly in extractive industries with emphasis on methods transferable to other domestic industry.	Assumes a low profile on G-77 issues.
Swaziland (\$400)	Market economy; courts foreign private investment for development of export industries.	13%	7	NA	NA	NA	M	-	Access to basic agricultural and food processing technology to enhance domestic self-sufficiency; and advanced consumer goods technology for penetrating South African markets (TV assembly, farm tractor production).	Not active on global S&T issues.
Syria (\$750)	Market economy with elements of socialism; permits wholly owned foreign investment in free zones and joint ventures in state-controlled industries.	19%	240	481 (29)	10 (1)	M	H	-	Access to technology for nuclear power development, oil exploration and production, and agricultural development.	Supports G-77 position on technology transfer code.
Tanzania (\$145)	Socialist economy in the modern sector; fears foreign domination of the economy; recent events, however, indicate some loosening of restrictions on investment.	approx. 10%	224	236 (33)	NA	L	L	-	Access to basic industrial and agricultural technology with increasing emphasis on heavy industry.	Supports G-77 position on technology transfer code; seeks increased official technical assistance.

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## Technology Transfer Matrix (Continued)

Country (Per Capita GNP)	Economic System	Manufacturing Sector		Engineering Products Trade		S&T Development			Key Technology Concerns	Stances on G-77 Proposals
		GNP Share	Labor Force (Thousands)	Imports (Million \$ and %)	Exports (Million \$ and %)	Scope <sup>1</sup>	Depth <sup>1</sup>	Migration <sup>2</sup>		
Thailand (\$370)	Market economy; offers incentives for foreign investment; uncertain political situation discourages foreign investment.	18%	1,170	1,140 (35)	36 (2)	M	M	-	Access to technology to expand agricultural and industrial production, especially for export; access to S&T for hydro-electric and nuclear power development and exploration of offshore petroleum reserves.	Takes low-key position on G-77 S&T proposals; not active in N/S discussions; generally supports G-77 positions on technology transfer code and brain drain
Togo (\$215)	Market economy with elements of socialism; offers incentives for foreign investment contributing to economic development.	13%	58	48 (28)	1 (less than 1)	L	M	NA	Access to basic technology for agriculture and industry, including phosphate mining and cement production.	Not active on global S&T issues.
Trinidad and Tobago (\$2,365)	Market economy; provides incentives for foreign investment; seeks joint ventures.	23%	79	245 (16)	13 (less than 1)	M	H	-	Access to technology for offshore petroleum exploration, refining, and development of industries based on natural gas.	Supports G-77 positions on technology transfer code and brain drain issues.
Tunisia (\$765)	Market economy with elements of socialism; actively seeks foreign investment in labor-intensive industries and in industries processing raw materials for export.	approx. 10%	266	526 (34)	10 (1)	M	H	-	Access to mining S&T (phosphates, iron ore), and to technology for development of petroleum and agriculture.	Supports G-77 position on technology transfer code.
Uganda (\$220)	Market economy; chaotic public administration and neglect of the economy have seriously impeded both domestic and foreign investment.	less than 10%	NA	57 (44)	NA	L	L	-	Access to basic agricultural and light industrial technology.	Seeks increased official technical assistance.

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United Arab Emirates (\$9,570)	Market economy with large public sector; welcomes foreign investment for its technology and expertise; has yet to formulate a coherent or consistent policy toward foreign investment.	less than 10%	40	495 (29)	NA	L	M	+	Access to advanced petroleum S&T and to technology to aid in development of social and economic infrastructure.	Not active on global S&T issues.
Upper Volta (\$100)	Market economy; liberal investment code provides incentives for foreign investment in mineral exploitation and primary product processing.	15%	150	41 (27)	Negl	L	L	-	Access to basic agricultural and industrial technology (irrigation, food processing and tire retreading); access to mining, construction, and transport technology for the Tambao manganese project.	Seeks increased official technical assistance.
Uruguay (\$1,105)	Market economy with elements of socialism; welcomes foreign investment in export industries based on domestic raw materials.	23%	345	33 (18) (1972)	3 (approx. 1)	M	H	°	Access to advanced industrial technology; assurance of a fair payments structure.	Supports international code of conduct for technology transfers; issue has low priority.
Venezuela (\$2,500)	Market economy with government control of basic natural resources; most foreign investment limited to minority equity position; seeks foreign investment as a vehicle for technology transfer; favors investments in agriculture, petrochemicals, and heavy industry.	19%	629	2,793 (48)	25 Negl	M	H	+	Access to technology for petroleum sector (offshore exploration, extraction and refining of very heavy oils) and for its expanding nonpetroleum industrial sector (steel, aluminum, hydroelectric generation).	Plays a leading role in promoting G-77 demands on technology transfer; primary drafter of G-77 resolution on obstacles to application of S&T for development.
Zaire (\$125)	Market economy with state control of large firms; generally welcomes foreign investment.	less than 10%	711	300 (32)	6 (less than 1)	M	L	°	Access to basic technology for agriculture, mining, and industry; especially concerned with copper and other minerals/metals technology.	Supports G-77 positions on technology transfer code and brain drain issues.
Zambia (\$400)	Market economy with elements of socialism; seeks foreign investment for development of agriculture and import substitution; requires joint ventures.	13%	130	329 (35)	NA	L	M	NA	Access to technology for import substitution (tires, shoes, textiles), development of the copper industry, and expansion of agriculture.	Not active on global S&T issues.

<sup>1</sup> Symbols in these columns denote *high*, *medium*, and *low* ranking; see opening statement for further explanation.

<sup>2</sup> Symbols in this column are: +, for net gainer of educated people; -, for net loser; ° for no significant net flow; and NA, for no data available.

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APPENDIX A  
TECHNOLOGY TRANSFER SECTION OF THE  
MANILA DECLARATION

Section Five

TRANSFER OF TECHNOLOGY

I. Action to strengthen the technological capacity of developing countries

1. Decisions should be reached at UNCTAD IV for strengthening the technological capacity of developing countries and thereby reducing their technological dependence. Developing countries should consider measures for formulating national policies, regulations and laws and establishing appropriate institutional structures at the country level, and explore the main lines of co-operation among themselves. These measures should be complemented by a full range of technical assistance activities necessary for interlinking the measures at the national, sub-regional, regional and international levels through the formulation of appropriate international policies. Such assistance requires effective co-operation from the developed countries, as well as co-ordinated action by international organizations. In considering these measures, account should be taken inter alia, of resolution 2 (I) of the Committee on Transfer of Technology and General Assembly resolution 3507 (XXX).

A. Action by the developing countries

2. The developing countries should give consideration, at the national level, to:

- (a) Formulation of a technology plan, as an integral part of their national development plans, as well as the co-ordination of policies in a number of interrelated areas, including licensing arrangements, transfer, development and adaptation of technology, industrial property laws and practices, foreign investments, research and development;

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- (b) Establishment of appropriate institutional machinery, including national centres for the development and transfer of technology with urgent attention being paid to defining the role and functions of such centres, including the principal linkages which need to be established with other national bodies or institutions;
- (c) Elaboration of all necessary measures to ensure optimum utilization of their qualified manpower resources.

B. Co-operation among developing countries

3. To supplement the national effort, the developing countries should give consideration at the sub-regional, regional and inter-regional levels to:

- (a) Elaboration of preferential arrangements for the development and transfer of technology among themselves; these preferential arrangements for co-operation should, inter alia, be consistent with arrangements involving sub-regional and regional co-operation and integration;
- (b) Establishment of sub-regional and regional centres for the development and transfer of technology which could serve as essential links with national centres in developing countries, and also to implement initiatives such as:
  - (i) Exchange of information on technological alternatives available to developing countries as a means of improving their negotiating power;
  - (ii) Institutional arrangements in respect of common technological research and training programmes;
  - (iii) Assisting national centres effectively to fulfil their role, inter alia, in implementing a code of conduct for the transfer of technology and preparing model contracts for licensing agreements on patents;
- (c) Establishment of sub-regional, regional and inter-regional centres by the developing countries in specific and critical sectors of particular interest to these countries.

C. Co-operation from the developed countries

4. Developed countries should implement, as a matter of urgency, the

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programme of action spelled out in paragraphs 13, 16, 17 and 18 of Conference resolution 39 (III), as supplemented and reinforced by the decisions of the sixth and seventh special sessions of the General Assembly, culminating in General Assembly resolution 3517 (XXX).

5. The developed countries should grant the developing countries unrestricted access to existing technology irrespective of the ownership of such technology.

6. The developed countries should co-operate actively and positively in the implementation of General Assembly resolution 3507 (XXX) on the establishment of industrial technological information banks, centres for the development and transfer of technology and/or other viable information systems.

7. Developed countries should refrain from pursuing policies which might encourage the exodus of trained personnel from developing countries, since this is seriously jeopardizing their progress.

D. Action by international organizations

8. The fourth session of the Conference should take decisions to establish the necessary institutional basis to enable UNCTAD to meet the responsibilities assigned to it in the area of technical and operational assistance, in co-operation with the international organizations concerned, particularly UNIDO, as outlined in Conference resolution 39 (III), resolution 2 (I) of the Committee on Transfer of Technology and General Assembly resolution 3507 (XXX).

9. In this context, a Technical Advisory Service should be immediately established within UNCTAD to render assistance at the request of developing countries, and UNCTAD's capacity in this field should be strengthened.

II. Decisions on a code of conduct for the transfer of technology and, in the light of these decisions, a decision on the modalities for its establishment

10. In order to facilitate and increase the international flow of all forms of technology under favourable terms and conditions, eliminate restrictive and unfair practices affecting technology transactions, and strengthen the national technological capabilities of all countries, a multilateral legally

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binding instrument is the only way of efficiently regulating transfers of technology, taking into consideration the particular needs of the developing countries.

11. In this connexion, it is proposed that, in pursuance of paragraph III (3) of General Assembly resolution 3362 (S-VII), the Conference should request the General Assembly at its thirty-first session to call a plenipotentiary conference under the auspices of UNCTAD during 1977 to establish a multilateral legally binding code of conduct on transfer of technology. At the same time the General Assembly should establish a preparatory committee to make the necessary preparations for the conference of plenipotentiaries; the preparatory committee, which should be open to the participation of all members of UNCTAD, should hold its first session as early as possible.

12. The proposal submitted by the Group of 77 (annex II to the report of the Intergovernmental Group of Experts on a Code of Conduct on Transfer of Technology - TD/B/C.6/14) should form the basis of subsequent negotiations.

III. Actions to be undertaken by UNCTAD with respect to the economic, commercial and development aspects of the international patent system in the context of the ongoing revision of that system

13. (a) For patent legislation to be an important instrument for the economic development of the developing countries, it should be designed to serve their public interest, i.e. their developmental needs as defined in the national, regional or sub-regional plans, policies and priorities, and should basically be geared to creating conditions for optimal use as well as for the creation of knowledge and technology to further the social objective of industrialization.

(b) National legislation of developing countries on inventions, where it exists, should ensure that the granting of property rights by the State is accompanied by corresponding obligations on the part of the patentee.

(c) Adequate exploitation of the patents granted would contribute towards fulfilling the developmental needs stated above.

14. In view of the importance attached by the developing countries to the economic, social and development implications which the international system of industrial property has for their economies, UNCTAD should play a prominent role in the revision of the system, in particular in the ongoing process of revision of the Paris Convention for the Protection of Industrial

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Property. That role should include the participation of UNCTAD in all phases of the revision process.

15. The conclusions reached by the experts from developing countries who participated in the meeting of the Group of Governmental Experts on the Role of the Patent System in the Transfer of Technology to Developing Countries (TD/B/593, annex III) should be one of the bases for subsequent negotiations.

16. The Secretary-General of UNCTAD should continue to examine the impact of the whole industrial property system on the development process of the developing countries.

17. Resolution 3 (1) of the Committee on Transfer of Technology should form a basis for further co-operation between UNCTAD and the international agencies concerned, particularly WIPO and UNIDO, in the preparation of the necessary background studies for the revision of the international system of industrial property.

18. The economic, trade and development interests of the developing countries should be fully reflected in the revision of the international system of industrial property and, in particular, in the revised Paris Convention. The Declaration on the Objectives of the Revision of the Paris Convention (WIPO document PR/GE/II/14) is, in this connexion, noted with interest.

19. The invitation sent by the Director-General of the World Intellectual Property Organization to all States Members of the United Nations and the specialized agencies to participate in the third session of WIPO's Ad Hoc Group of Governmental Experts' Committee on the Revision of the Paris Convention is to be welcomed as a step which can contribute significantly to the full reflection of the interests of the developing countries in the revision of the international system of industrial property, and all developing countries are urged to prepare themselves for active participation in that session.

#### IV. Other issues

20. As regards the United Nations Conference on Science and Technology and reverse transfer of technology (the "brain drain"), the decisions taken by

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the Committee on Transfer of Technology in its resolution 2 (I), should be fully implemented.

21. In order to compensate for the reverse transfer of technology resulting from the exodus of trained personnel from the developing countries, now amounting to several billion dollars, arrangements should be made to provide, on a cost-free basis, the necessary financial means to create the infrastructure to retain qualified personnel in the developing countries.

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## APPENDIX B

## MEASURING S&amp;T DEVELOPMENT IN LDCs

**Rationale**

A wide variety of criteria can be used in S&T ranking of LDCs. The most sensible in terms of improving living standards is the S&T contribution to economic development. To measure this for the purposes of the S&T development columns in the country matrix, we have inspected various direct and indirect indicators. The direct sets included data on S&T personnel and high-technology facilities in Third World countries. The indirect series were economic data sets for national accounts and trade that we felt correlated strongly with levels of technology.

Selected data from both sets were integrated to form two composite indexes of S&T capability: (1) a *scope* index, which is intended to provide a sense of each country's ability to engage in complex S&T activities; and (2) a *depth* index, which is scaled for population or shares of economic activity, and thereby designed to indicate the extent to which S&T capabilities are spread among the population. On both indexes each country is ranked high, medium, or low relative to all other LDCs examined.

**Integration of the Series Into Ranks**

The basic, and simple, methodology underlying integration of our various scientific and economic series was the selection of countries according to whether they fell in a high, medium, or low rank three times in a chosen set of five indicators. This "rule of three" was further adapted so that any country with three indicators in the high and middle groups combined was placed in the middle group. Otherwise, borderline cases were placed on the basis of practical working experience or analogy to like countries' placement—that is, by inference.<sup>5</sup>

**The Integrated S&T Scope List**

This list (table B-2) was derived from clusters of the following five series: numbers of scientists, technicians, and students; numbers of computers and nuclear reactors; numbers of published scientific books; total value of scientific and technical imports; and total value of exports of manufactures. These objective criteria placed about 75 percent of the countries without using inference.

<sup>5</sup> Table B-1 shows rankings of 24 key actors on the 10 series used to compile the integrated lists.

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Table B-1

## Measures of S&amp;T Development in 24 Key LDCs

	Scope					Depth				
	Number of Scientists, Technicians, and Students	Number of Computers and Nuclear Reactors	Number of Scientific Book Titles Published	Total Value of Scientific and Technical Imports	Total Value of Exports of Manufactures	Literacy	Per Capita Income	Machinery and Equipment Imports Per Capita	Manufactures as a Share of GNP	Manufactures Exports Per Capita
Algeria	H	H	—	H	M	L	H	H	M	—
Argentina	H	H	M	M	H	H	H	H	H	H
Brazil	H	H	H	H	H	M	H	H	H	M
Colombia	H	H	—	M	H	M	H	M	H	M
Egypt	H	—	M	H	H	M	M	M	H	M
India	H	H	H	H	H	M	L	L	M	L
Indonesia	H	—	M	H	H	M	M	M	L	L
Iran	H	H	M	H	H	M	H	H	M	M
Iraq	H	H	L	H	—	L	H	H	M	L
Ivory Coast	M	M	M	M	H	L	H	H	M	H
Jamaica	M	M	—	M	H	H	H	H	M	H
Jordan	M	—	L	M	M	M	M	H	M	M
Kuwait	M	L	L	M	H	M	H	H	L	H
Libya	M	H	—	H	—	M	H	H	L	—
Malaysia	M	M	M	M	H	H	H	M	M	H
Mexico	H	H	H	H	H	H	H	H	H	M
Nigeria	H	M	M	H	M	L	M	M	L	L
Pakistan	H	M	L	M	H	L	L	M	M	M
Peru	H	M	L	M	M	M	H	H	H	L
Philippines	H	H	—	H	H	M	M	M	H	M
Saudi Arabia	M	—	L	H	—	L	H	H	L	—
Sri Lanka	M	L	M	L	M	H	M	L	M	L
Venezuela	H	—	—	H	M	H	H	H	H	M
Zaire	M	L	—	M	M	M	L	M	L	L

Note: Rankings relative to 104 LDCs surveyed.

H = High

M = Medium

L = Low

— = Data unavailable

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Table B-2

## Science and Technology in the LDCs: Scope Ranking

High Group		Low Group	
Algeria	Indonesia	Afghanistan	Madagascar
Argentina	Iran	Angola	Malawi
Brazil	Iraq	Bahamas	Maldives
Chile	Korea (South)	Bahrain	Mali
China (Taiwan)	Mexico	Bangladesh	Mauritania
Colombia	Philippines	Barbados	Mauritius
Egypt	Singapore	Benin	Mozambique
India		Bhutan	Nepal
		Botswana	Niger
		Burma	Oman
		Burundi	Paraguay
		Cameroon <sup>1</sup>	Qatar
		Cape Verde	Rwanda
		Central African Empire	Sao Tome/Principe
		Chad	Seychelles
		Comoros <sup>2</sup>	Sierra Leone
		Congo	Somalia
		Dominican Republic	Sudan
		Equatorial Guinea	Surinam
		Ethiopia	Tanzania
		Gabon	Togo
		Gambia	Uganda
		Guinea	United Arab Emirates
		Guyana	Upper Volta
		Haiti	Western Samoa
		Honduras	Yemen (North)
		Lesotho	Yemen (South)
		Liberia	Zambia

<sup>1</sup> Borderline case—moved down.<sup>2</sup> Based on LLDC status.

One notable feature of this table that distinguishes it from the depth list is its generally lower placement of countries of the Arabian peninsula. Other results were a bit surprising. Thus, Algeria, Egypt, and Iraq surfaced in the high group primarily because of numbers of science students or personnel and—for Algeria—computers. Available science data on Venezuela, a country that seemed to belong in the high group, suggested that it was not especially well endowed with such hardware as computers or nuclear reactors.

Less surprising was the fact that this list had the weaker connection to per capita income levels. This was partly a function of the exclusion of the per capita criterion here for subsequent use in the depth list and partly a product of the greater implicit importance of factors of scale, which tended to favor large put poor countries (such as India and Egypt).

#### The Integrated S&T Depth List

This list (table B-3) was based on cluster analysis of the following five series: literacy rates; per capita income; per capita imports of machinery and equipment; manufacturing as a share of national output; and per capita

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exports of manufactures. The results were much more satisfying thanks to the broader coverage possible with economic (as compared to scientific) data. Some 90 percent of the countries were placed by the objective criteria, and the cases of inference were much more clear-cut. Not surprisingly, all but two of the high S&T group—El Salvador and Syria—ranked as high-income countries according to World Bank criteria. On the other hand, many high-income countries were selected out of the high S&T group for various reasons:

- The Middle Eastern OPEC countries ranked below the top group primarily because of low literacy rates and modest exports of manufactures.
- Several Central and South American countries did not make it because they had relatively small manufacturing sectors and trade values.

These shifts lead us to believe that the notion of a depth ranking beyond the classic per capita income series serves a useful purpose.

Table B-3

## Science and Technology in the LDCs: Depth Ranking

High Group		Medium Group (Continued)	
Argentina	Jamaica	Madagascar	Saudi Arabia <sup>1</sup>
Bahamas	Korea (South)	Mauritania	Senegal
Bahrain	Kuwait <sup>1</sup>	Mauritius	Sierra Leone
Barbados	Malaysia	Morocco	Sri Lanka
Brazil	Mexico	Mozambique	Swaziland
Chile	Nicaragua	Oman	Thailand
China (Taiwan)	Panama	Pakistan	Togo
Costa Rica	Peru	Papua-New Guinea	United Arab Emirates <sup>1</sup>
Cyprus	Qatar <sup>1</sup>	Paraguay	Yemen (South)
El Salvador	Singapore	Philippines	Zambia
Fiji	Surinam		
Gabon <sup>1</sup>	Syria	Low Group	
Guyana	Trinidad and Tobago	Afghanistan	Malawi
Hong Kong	Tunisia	Bangladesh	Maldives <sup>4</sup>
Ivory Coast	Uruguay	Benin	Mali
	Venezuela	Bhutan <sup>1</sup>	Nepal
		Burma	Niger
Medium Group		Burundi	Nigeria <sup>1</sup>
Algeria	Guatemala	Cape Verde	Rwanda
Angola	Haiti	Central African Empire	Sao Tome/Principe
Bolivia	Honduras	Chad	Somalia
Botswana <sup>2</sup>	Indonesia	Comoros <sup>4</sup>	Sudan
Cameroon	Iran	Equatorial Guinea <sup>5</sup>	Tanzania
Colombia	Iraq	Ethiopia	Uganda
Congo	Jordan	Gambia <sup>6</sup>	Upper Volta
Dominican Republic	Kenya	Guinea	Yemen, (North)
Ecuador	Lebanon <sup>3</sup>	India	Zaire
Egypt	Liberia	Lesotho	
Ghana	Libya		

<sup>1</sup> These OPEC countries showed an unusual division between high and low categories (see text).

<sup>2</sup> No in-depth trade data.

<sup>3</sup> Underlying economic data for Lebanon necessarily reflect wartime distortions. Country ranking may accordingly understate potential, although migration, property destruction, and capital flight suggest standing as shown is currently accurate.

<sup>4</sup> Included on basis of LLDC status.

<sup>5</sup> Borderline case—moved down.

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## APPENDIX C

### GLOSSARY OF TERMS AND ACRONYMS

*Brain drain:* Loss of skilled manpower through migration.

Sometimes referred to as reverse transfer of technology.

*Engineering products:* Machinery and transport equipment and parts, including power-generating machinery, telecommunications apparatus, industrial and agricultural machinery, and equipment for all forms of transportation (Section 7 of the UN's Standard International Trade Classification scheme). Production and trade data for engineering products provide indirect indicators of LDC S&T capabilities.

*Group B:* The developed nations' UN caucus in the North-South dialogue.

*Group of 77 (G-77):* The LDCs' UN caucus in the North-South dialogue. Membership has now reached over 115 LDCs.

*International Code of Conduct on Transfer of Technology:* From the G-77 viewpoint, an instrument, binding in international law, that would regulate and restrict the activities of technology suppliers for the benefit of the LDCs. From the Group B viewpoint, voluntary guidelines setting forth "general and equitable principles based on mutual respect for the legitimate interest of all parties to the transfer as well as of governments."

*Manila Declaration:* The most recent comprehensive statement by LDCs of their demands in the North-South dialogue; adopted by G-77 ministers in February 1976. The text of the technology transfer section of the Declaration is given in appendix A.

*New International Economic Order (NIEO):* The NIEO, a statement of LDC demands for reform of the international economy, was promulgated as a UN resolution at the Sixth Special Session in 1974. It called for: (a) structural changes in existing international institutions (UN, World Bank, International Monetary Fund—IMF); and (b) creation of new institutions (Common Fund, International Seabed Authority) to increase LDC political and economic power relative to the industrial nations.

*"Obstacles" to the application of science and technology for development:* Generally, institutional features perceived as hindering the transfer of technology and growth of S&T capabilities of LDCs. From the G-77 viewpoint, examples would include the alleged restrictive practices of multinational corporations and the lack of an international risk capital fund for financing technological development in LDCs. From the Group B viewpoint, the application of S&T is hindered primarily by the lack of concrete, coordinated S&T development policies and the shortage of competent personnel in the LDCs themselves.

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*Paris Convention:* An international treaty for the protection of industrial property (patents, trademarks, industrial designs) signed in Paris in 1883 and currently undergoing the latest in a series of revisions.

*Proprietary technology:* Technology for which property rights are granted by law and which is available only through purchase or license from its owner; includes most advanced industrial processes.

*Reverse transfer of technology:* See brain drain.

*Technical cooperation among developed countries (TCDC).* An attempt on the part of the LDCs to supplement—and in some cases replace—technical assistance from the industrialized nations by drawing on the pool of S&T experience and resources held by the LDCs as a group (the S&T aspect of the NIEO goal of greater national and collective self-reliance); subject of a UN conference held in Buenos Aires on 30 August through 12 September 1978.

*Technology bank:* An institution designed to increase the flow of technology to the LDCs by: (a) in its radical formulation, supplying them at little or no cost with technologies bought for the bank by the industrialized nations; or (b) in a more moderate formulation, providing a centralized source of information on currently available technologies. Conceivably, the proposed US Foundation for International Technological Cooperation (FITC) would serve some of the purposes subsumed in the moderate formulation.

*United Nations Conference on Science and Technology for Development (UNCSTD):* The first major global review of the application of science and technology to the development problems of the LDCs; to be held in Vienna in August 1979. In preparation for the Conference each country is drafting a descriptive national paper setting forth its experience, needs, potential, and goals in science and technology. The UN's five regional commissions will review the national papers. Priorities that emerge globally will determine the conference agenda.

*World Intellectual Property Organization (WIPO):* A specialized agency of the UN, established to promote the international protection of intellectual (including industrial) property; comprises a central administrative coordinating body for 11 individual unions (such as the Berne Union and the Paris Union) dealing with legal and technical aspects of intellectual property.

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